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Margolina, Tetyana

Monterey, California. Naval Postgraduate School



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NAVAL POSTGRADUATE SCHOOL

MONTEREY, CALIFORNIA

High Frequency Acoustic Recording Package
Data Summary Report
PS07, April 30, 2009 – September 22, 2009

by
Tetyana Margolina

February 2011

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Prepared for: CNO(N45), Washington, D.C.

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This report was prepared by:

Tetyana Margolina
Research Associate

Reviewed by:

Released by:

Jeffrey Paduan
Department of Oceanography

Karl Van Bibber
Vice President and Dean of Research

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ABSTRACT

This summary continues a series of reports on the project, which seeks to assemble a census of marine mammal vocalizations in the high-frequency acoustic recording package (HARP, Wiggins and Hildebrand, 2007) data collected by the NPS Oceanography Department off Point Sur beginning in October 2006. The present report provides an initial summary of marine mammal vocalizations detected and identified in records from the seventh HARP deployment between April 30, 2009 and September 22, 2009. Data was acquired in the 10 Hz – 100 kHz frequency band at a 200 kHz sampling frequency for 5 minutes during each quarter an hour. Long-term spectral averages were created for three frequency bands (10 Hz–1000 Hz, 1 kHz–5 kHz, 5 kHz–100 kHz) and then scanned for marine mammal vocalizations. Detected calls of blue whales, fin whales, humpback whales, as well as echolocations of sperm whales, beaked whales, and dolphins are presented as occurrence time diagrams.

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I. DATA

The PS07 HARP was deployed on top of Sur Ridge at $36^{\circ}23.336'N$, $122^{\circ}18.409'W$ on April 30, 2009 and recovered on September 22, 2009. The instrument location is shown in Fig. 1. Bottom depth at the deployment site was 847 m. A schematic diagram of the PS07 HARP mooring (courtesy of Ms. Marla Stone, Naval Postgraduate School) is given in Fig. 2. Temperature, salinity, and current data collected on the mooring have been described by Zamora (2009).

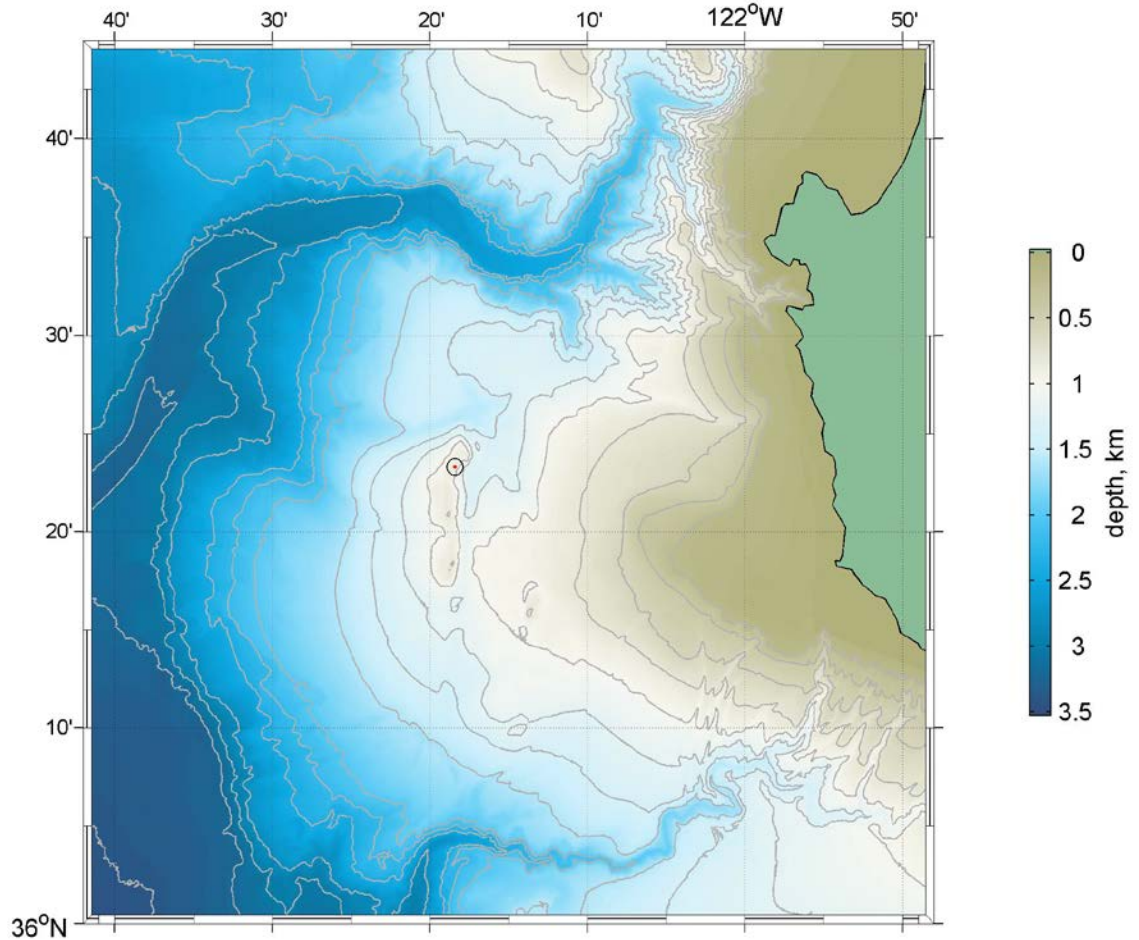


Figure 1. Chart showing PS07 HARP deployment location (red dot) to the west of Point Sur, California. The scale to the right indicates bottom depth in kilometers. Isobaths (gray lines) are shown at 200 m interval.

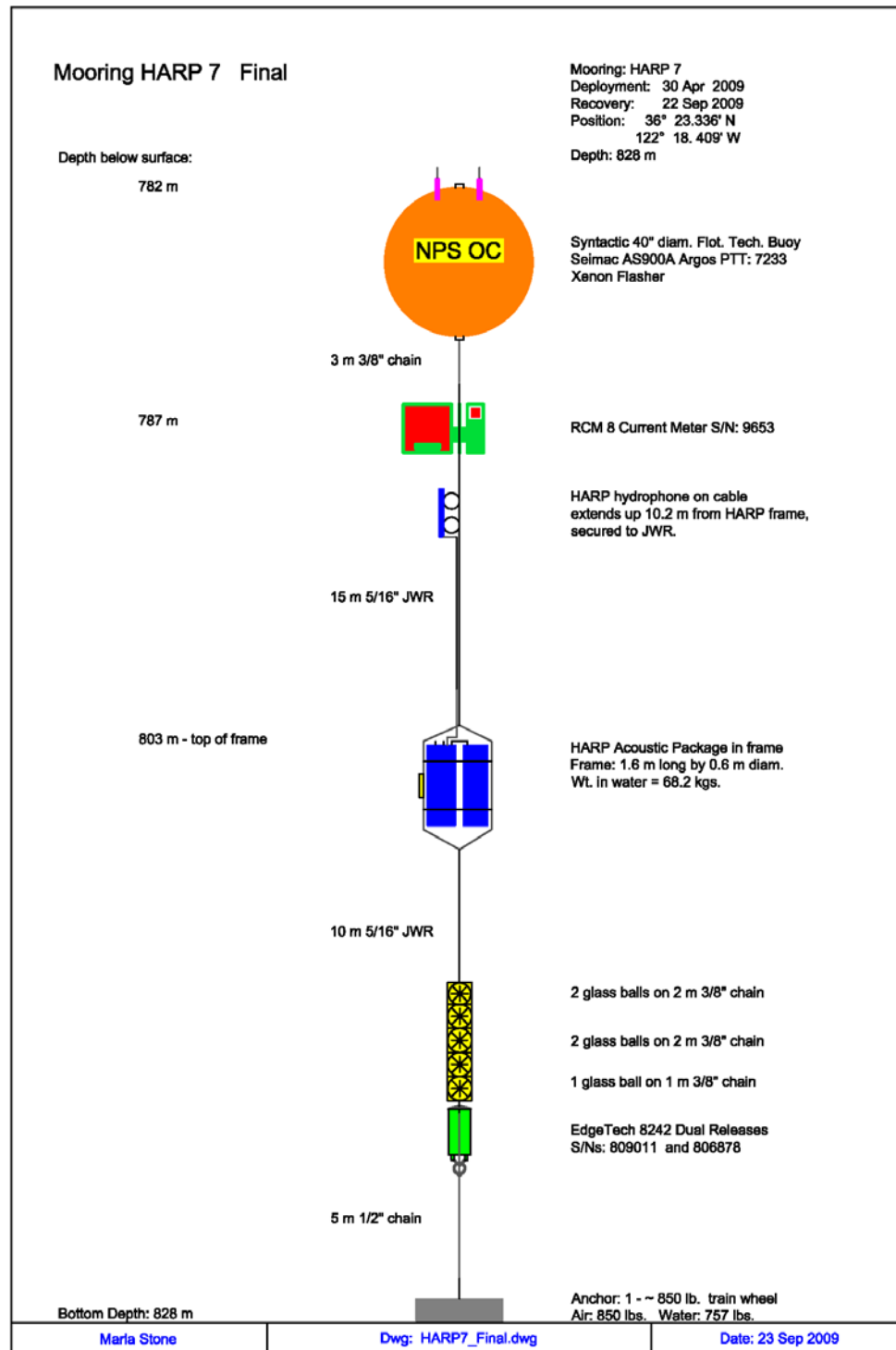


Figure 2. Schematic diagram showing details of the PS07 HARP. Note that objects and distances are not drawn to scale.

Data was acquired at a 200 kHz sampling frequency for 5 minutes during each quarter an hour. There is no data available for ten days in May (between May 21 and May 31, 2009), and two days in June (June 29-30, 2009). The PS07 HARP deployment provided a total of 1054 hours of data over the 145 days of recording (see Fig. 3).

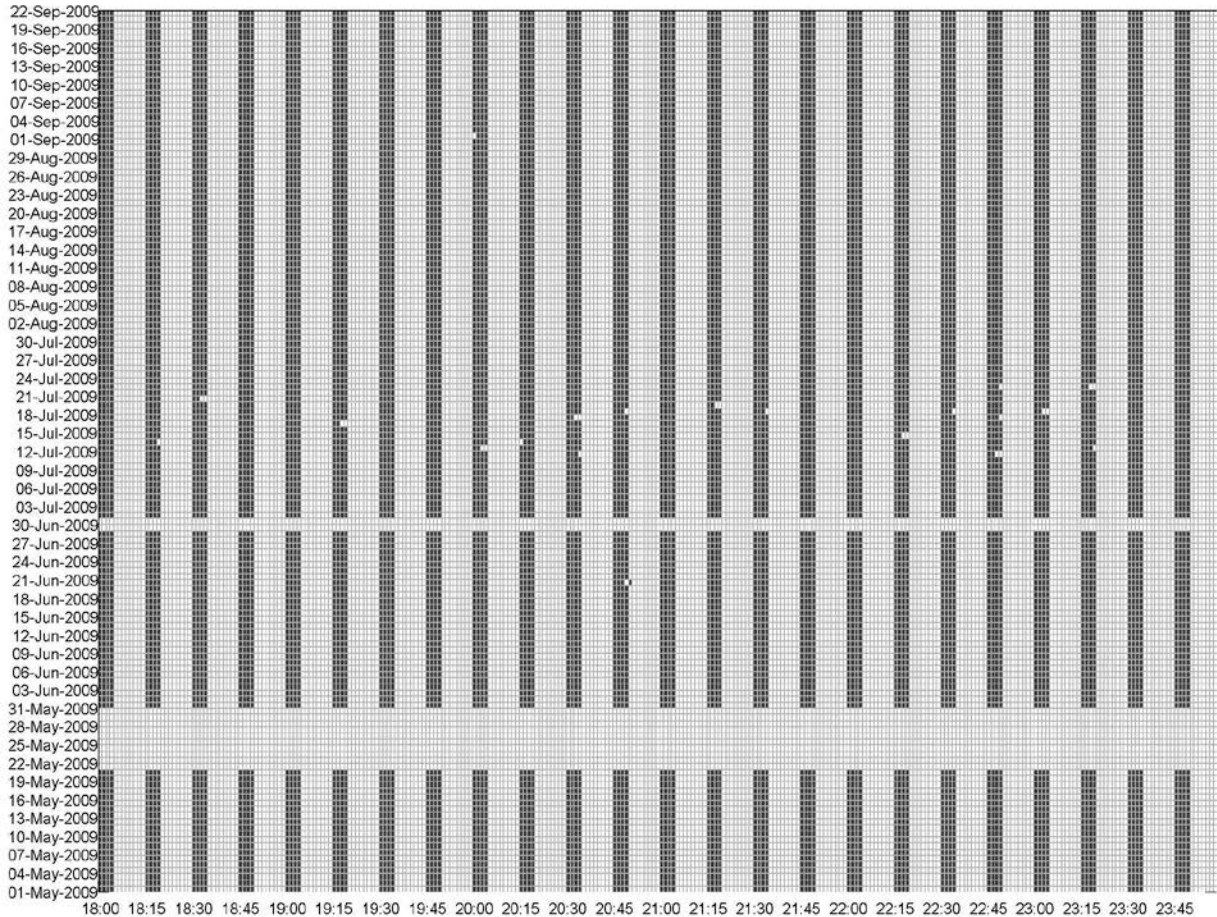


Figure 3. PS07 HARP schedule from 06:00:00 PM to 11:58:45 PM of each day. Each cell corresponds to one raw file of 75 s duration.

The PS07 HARP data were manually scanned for marine mammal vocalizations using the “logger” version of the Scripps *Triton* software (v1.7b.20100426_loggers) as described in Technical report # NPS-OC-10-003 “High Frequency Automatic Recording Package Data Summary Report PS05, August 4, 2008 – January 6, 2009” (available online at <http://edocs.nps.edu/npspubs/scholarly/TR/2010/NPS-OC-10-003.pdf>).

II. RESULTS

Table 1 summarizes detected and identified marine mammal vocalizations for the PS07 HARP deployment. Figs. 4–10 illustrate occurrence time for different species and call types in 75 s bins.

Both blue and fin whales were sparsely present during the first half of the deployment (in May, June and first half of July), daily in second part of July and August, and nearly permanent (as one can conclude from a scheduled recording) in September (Figs. 4-5).

The blue whale vocalizations consisted of A and B calls, either as songs or individual calls, as well as D calls associated with foraging. See also Table 1.

The observed fin whale calls were mostly 20 Hz calls.

Sperm whale clicks were rather sparse but nearly evenly distributed from May, 2009 to September, 2009 (Fig. 6).

Detected dolphin vocalizations included echolocation clicks, whistles, and burst pulses (Figs. 7-9). Dolphins were present throughout the PS07 deployment, about 70% of them identified as Pacific white-sided dolphins, which intensified during night time from May to September (Fig. 7). Risso's dolphins were detected during only 11 days, mostly in May 2009 (Fig. 8).

Sparse beaked whale vocalizations were present throughout the whole PS07 deployment (Fig. 10). Cuvier's echolocation pulses were identified on 13 days, mostly in July.

Table 1. Summary of identified marine mammal vocalizations.

| Species | Call type | Hours of vocalizations | Percentage of total recordings | Days with vocalizations | Percentage of total deployment duration |
|-----------------------------|-----------------------|------------------------|--------------------------------|-------------------------|---|
| Fin whale | 20 and 50 Hz | 541 | 51% | 61 | 42% |
| Blue whale | various | 829 | 76% | 69 | 51% |
| Blue whale | A call | 321 | 31% | 41 | 28% |
| Blue whale | B call | 760 | 72% | 63 | 43% |
| Blue whale | D call | 69 | 7% | 26 | 18% |
| Sperm whale | echolocation | 96 | 9% | 32 | 22% |
| Beaked whale (total) | echolocation | 14 | 1% | 31 | 23% |
| Cuvier's beaked whale | echolocation | 2 | <1% | 13 | 9% |
| Dolphins (total) | echolocation/whistles | 956 | 91% | 133 | 92% |
| Risso's dolphin | echolocation | 14 | 1% | 11 | 8% |
| Pacific white-sided dolphin | echolocation/whistles | 646 | 61% | 128 | 88% |
| Unidentified dolphin | echolocation/whistles | 296 | 28% | 116 | 80% |

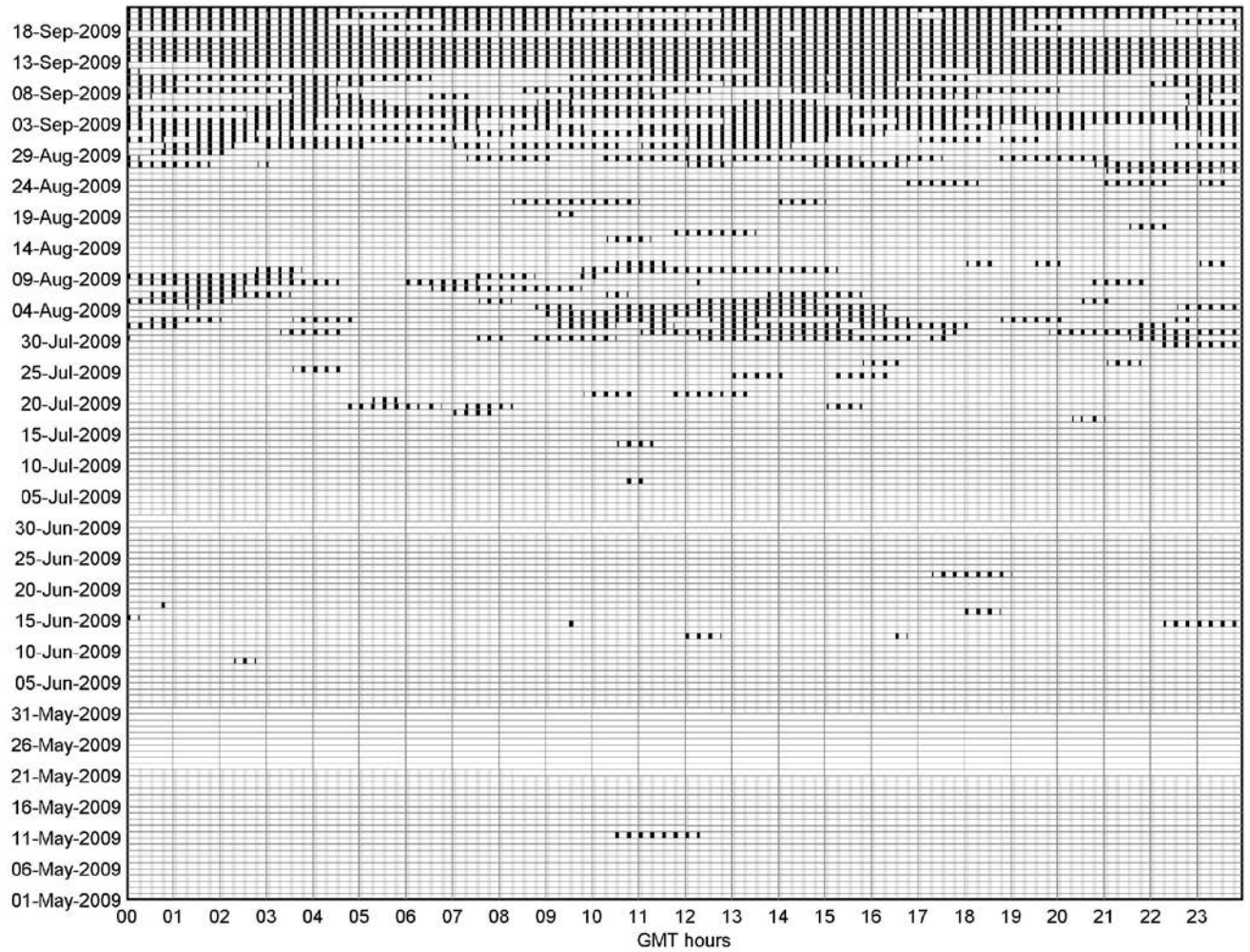


Figure 4. Fin whale calls in 75 s bins.

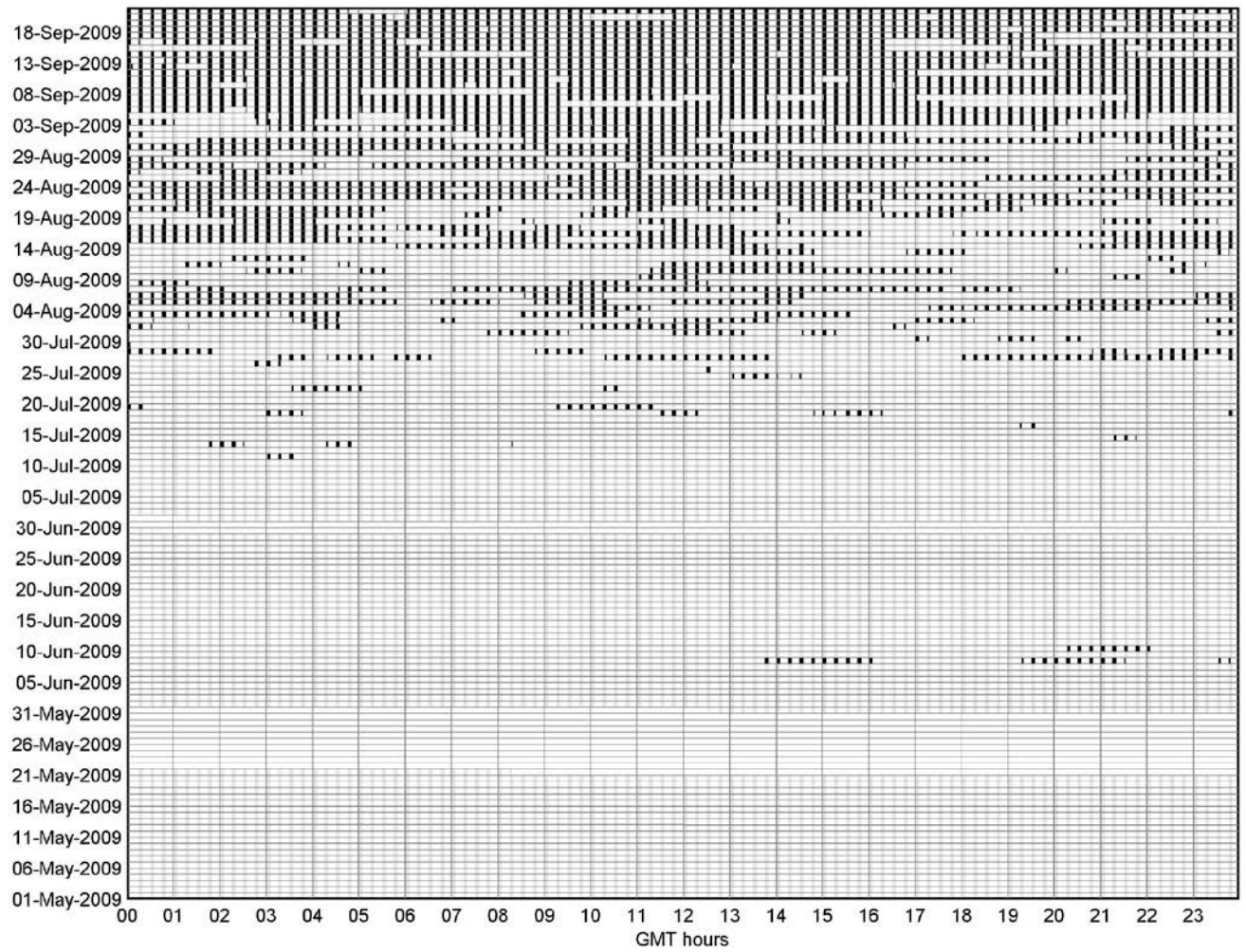


Figure 5. Blue whale vocalizations in 75 s bins.

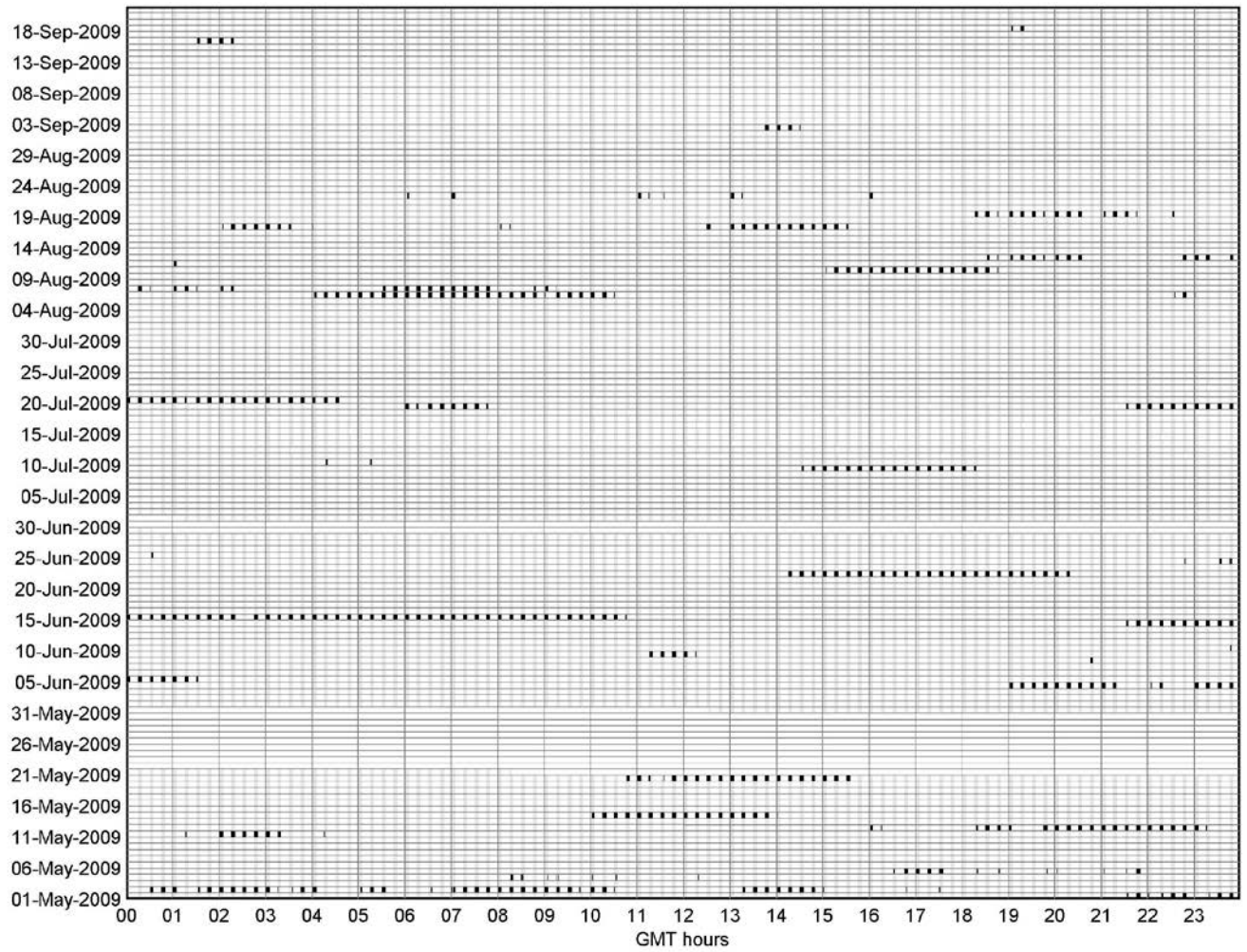


Figure 6. Sperm whale echolocation clicks in 75 s bins.

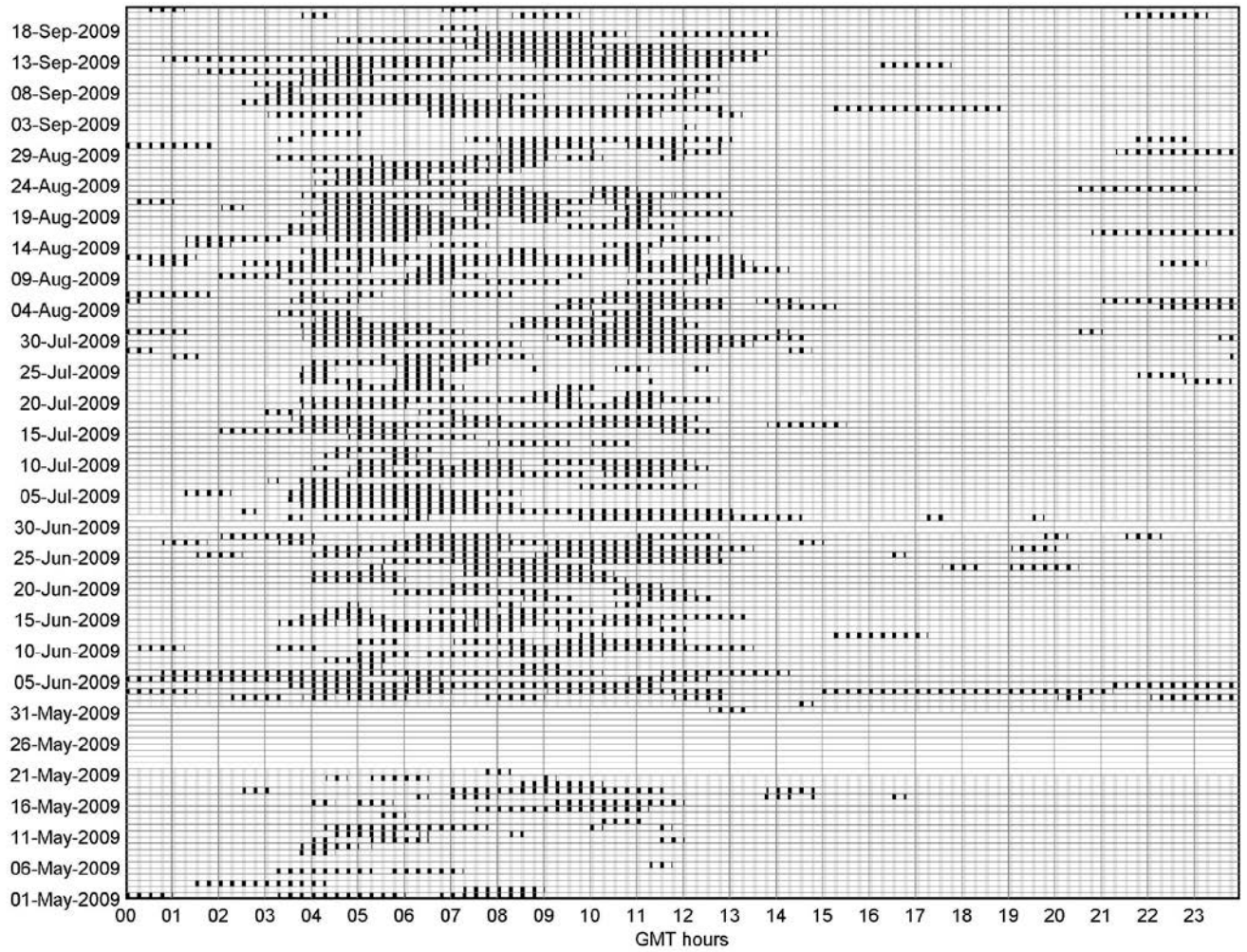


Figure 7. Echolocation clicks of Pacific white-sided dolphin in 75 s bins.

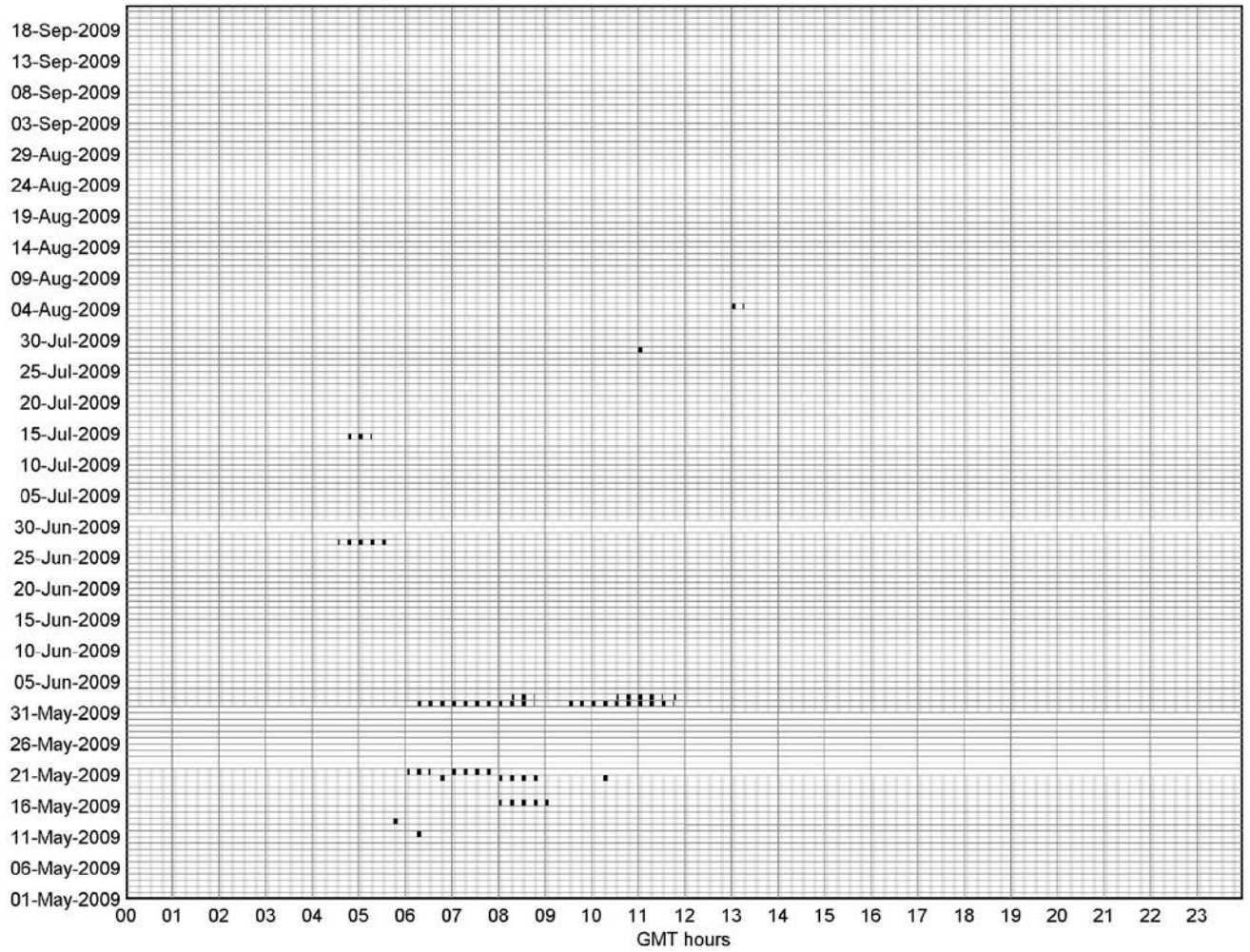


Figure 8. Risso's dolphin echolocation clicks in 75 s bins.

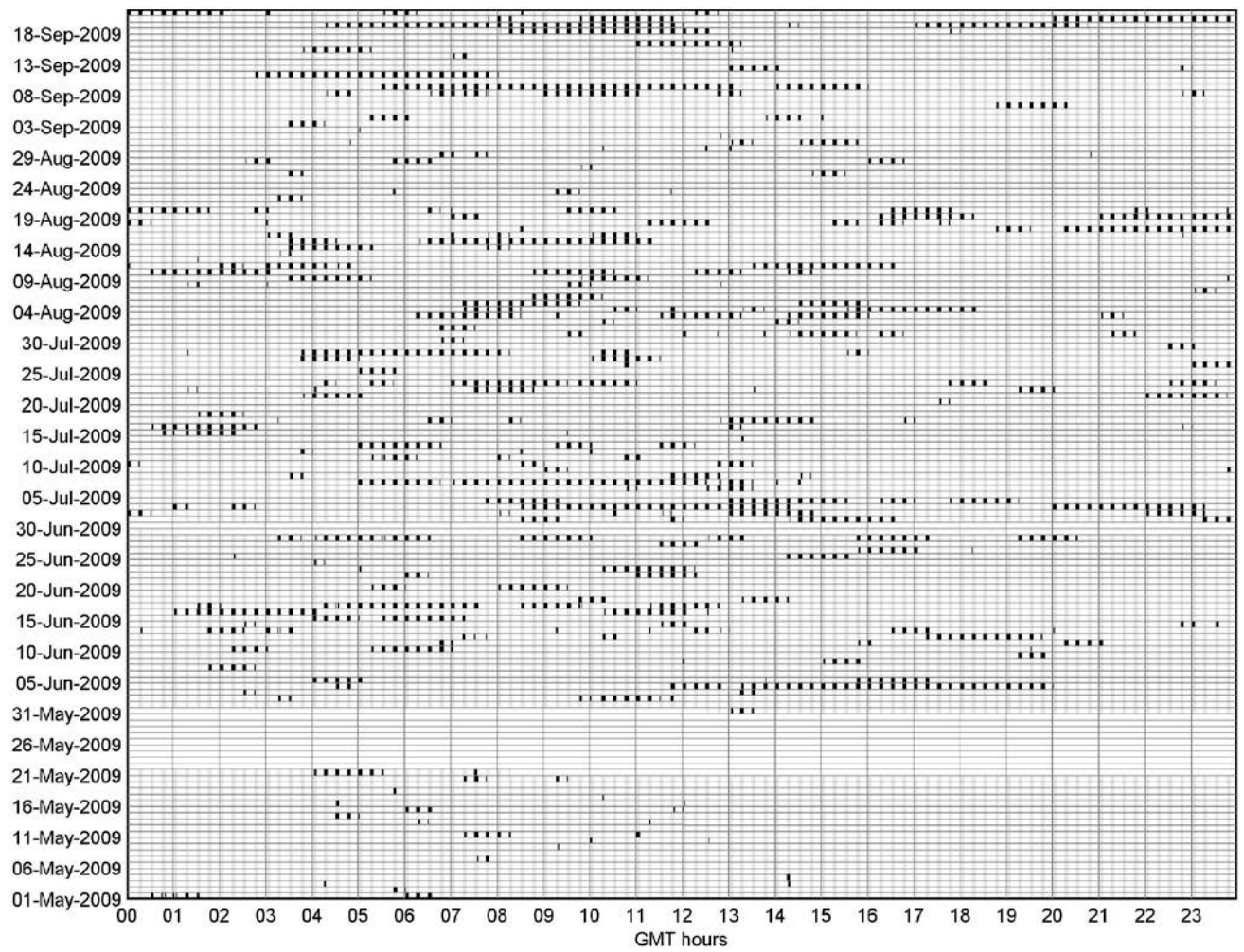


Figure 9. Echolocation clicks and whistles of unidentified dolphins in 75 s bins.

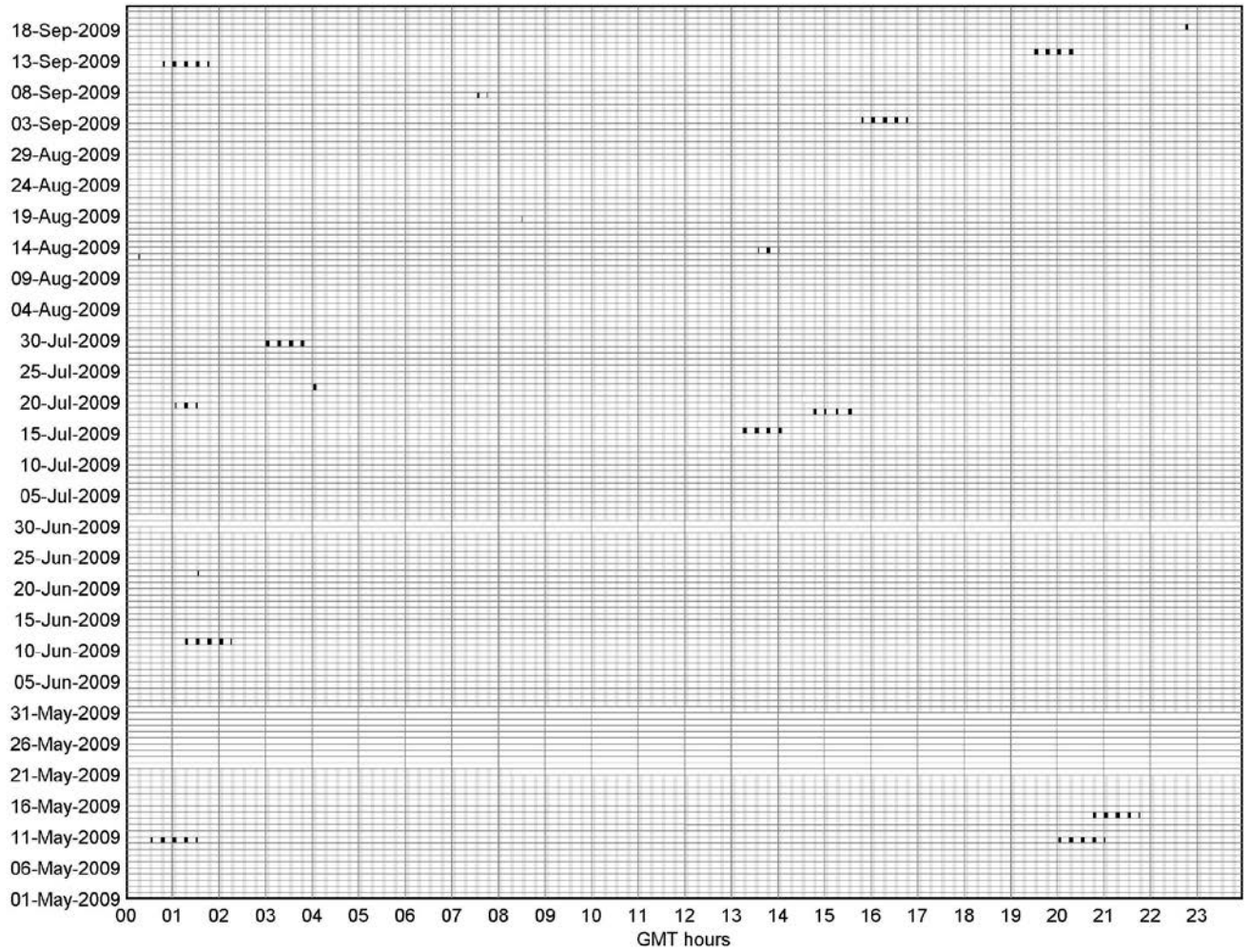


Figure 10. Beaked whale echolocation clicks in 75 s bins.

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